the teaching staff and graduates. The principal article in the first number will be an illustrated paper on "Architectural Acoustics" by Professor W. C. Sabine, with a practical discussion of a number of recent theaters, lecture halls and churches. The number will also contain several drawings of important examples of European architecture and an essay on "The Mediæval Town Halls of Italy" by H. E. Warren, S.M. in Architecture, 1905. Early numbers of the *Quarterly* will contain examples of recent work in architectural design by students of the school, a paper on professional practise, the substance of three lectures recently delivered before the school by Mr. Cass Gilbert, of New York (lately president of the American Institute of Architects), and papers on the teaching of architectural design by Professor Duquesne, on the study of architectural history in its relation to the professional study of architecture by Professor H. L. Warren, and further papers on acoustics by Professor Sabine.

THE PRESENT KNOWN DISTRIBUTION OF THE CHESTNUT BARK DISEASE.

THE writers published in Farmers' Bulletin 467, page 6 (issued October 28, 1911), a map showing the distribution of the chestnut bark disease as known in June, 1911. Since that time the disease has spread considerably, also our detailed knowledge of its distribution has increased. In the map here published, thin horizontal lines show the general distribution of uninfected *Castanea dentata*. Thick lines variously arranged in concentric bands indicate general regions of gradually increasing infection which culminate in the region of practically complete destruction of the tree about New York City. Black dots represent the location of advance infections, many of which have already been eradicated. The writers are under obligations to Dr. Perley Spaulding, Professor A. H. Graves, Mr. I. C. Williams, Mr. S. B. Detwiler and the members and employees of the Chestnut Tree Blight Commission of Pennsylvania, Mr. W. H. Rankin, Mr. J. F. O'Byrne, Mr. F. W. Besley, Dr. Ernest S. Reynolds, Mr. H. G. MacMillan, Professor H. R. Fulton and Mr. A. B. Brooks, for much of the data used in compiling this map.

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SPECIAL ARTICLES

SENILITY IN MERISTEMATIC TISSUE

MERISTEMATIC tissue in perennial plants is commonly believed to retain its embryonic condition unchanged. Senility is considered to occur only in specialized cells. A twig cut from a mature tree and planted or grafted is said to produce a new tree as youthful in its protoplasmic vigor as a seedling. While these are almost the unanimous opinions of the botanists, it is interesting to note that many fruit growers and gardeners have always held that vegetatively propagated plants tended to run out, as if through senility.

In order to determine, if possible, which of these views is better justified, a series of investigations on meristematic tissue in perennials of different ages have been carried out, and this article is a brief preliminary statement of one of the more obvious results.

The structure of the adult leaves gives valuable insight into the meristematic tissue, since any minute changes occurring in the latter will be made larger and more obvious in the leaves, just as the inherent characteristics of seeds become more apparent in the plants into which they grow. If, therefore, the meristematic tissue of a perennial is changing with the increasing age of the plant, the new leaves appearing each year should reveal differences. In order to eliminate differences due to external factors, leaves were taken from cuttings of *Vitis riparia* of different ages grown under identical conditions. Comparisons were also made between leaves borne by vines growing wild, side by side under apparently identical conditions, and on many other kinds of trees and vines.

An interesting condition in the venation of the compared leaves was one of the results noted and seemed to merit this preliminary note, because of the ease with which it may be recognized without apparatus by fruit growers as well as by botanists.

The smallest veinlets of the leaf form a continuous network and the meshes of this network are areas of parenchymatous tissue. The size of these areas is not only remarkably uniform in a mature leaf but is directly dependent upon the age of the plant upon which the leaf is growing. The older the plant, the smaller are the vein-areas of the leaf. This difference can be seen with a hand lens by holding the leaves up to the light. In *Vitis riparia,* for example, accurate measurements of hundreds of areas in leaves picked from different parts of the same vine, gave an average (vine 26 years old) area of .20398 sq. mm., while the largest measured .217 sq. mm. and the smallest .185 sq. mm. The comparison for leaves from vines of different ages is shown by the following table, which gives averages from leaves picked from many plants.

	4-5 Growth Rings.	6-12 G. R.	15-30.	35-50.
Cuttings of *V. riparia*...	.44 sq. mm.	.35	.29	
Wild vines of *V. riparia*.	.42	.33	.24	.16

Even where the leaves are very large, as in the case of those borne on water-shoots from living stumps, the size of the areas is that characteristic of leaves borne on the tree the age of the stump. One of the several series of this kind follows:

Tree of *Castanea dentata*	8 Rings	15 R., Water-shoot	30 R.	Tree 50 R.
Size of area	.07 sq. mm.	.05 sq. mm.	.04 sq. mm.	.03 sq. mm.

The results with cuttings, water shoots and selected vines plainly indicates that the difference in size of areas is not due to external conditions. The reason that a leaf from a tree 25 years old differs in its venation from a leaf of a tree 10 years old is therefore that the meristematic tissue, in the two trees of the same species growing under the same conditions, is different. Apparently the meristem of the older tree produces less efficient specialized tissues than does the younger. The parenchyma is less permeable, the vessels less efficient in conducting; the sap must be brought into closer contact with all the leaf protoplasm. Since the amount of carbohydrate producing parenchyma is being gradually decreased by the inroads of the conducting system, the leaf is becoming a less efficient manufacturer of carbohydrate and ultimately the plant must starve.

If the changes in the size of the vein-areas be plotted as a curve, the nature of the resulting curve is the same as when the recognized senility changes in man and animals are plotted. It is interesting to note that changes in the vascular system in plants are due to the increasing senility of the meristem, just as changes in the vascular system of animals are due to senility. Dr. Osler says that "a man is as old as his arteries," and it may be said of plants that they are as old as their veins.

Since the leaves borne by cuttings showed but slight increase in the proportion of carbohydrate-producing tissue as compared with those on the original plant, it would appear that vegetative propagation can not and does not produce a young plant. The fact that the normal span of life for woody trees and vines extends in some cases over hundreds of years accounts for the fact that the approach of senility in vegetatively propagated plants is not more obvious. Plants which naturally reproduce by seed will tend to "run out" after long-continued vegetative propagation, ultimately dying of senility, and it is therefore incumbent upon our plant breeders to develop new varieties from seed, to take their place.

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THE WASHINGTON MEETING OF THE AMERICAN CHEMICAL SOCIETY.

DIVISION OF INDUSTRIAL CHEMISTS AND CHEMICAL ENGINEERS

G. D. Rosengarten, *chairman.*

F. E. Gallagher, *secretary.*

H. C. Sherman, D. A. Bartlett and N. E. Weatherless: *Relation of Ultimate Composition to Calorific Power in Coal.*

The analyses and calorific powers of 67 coals